

Knowledge-Based System Environment

Example: CLIPS

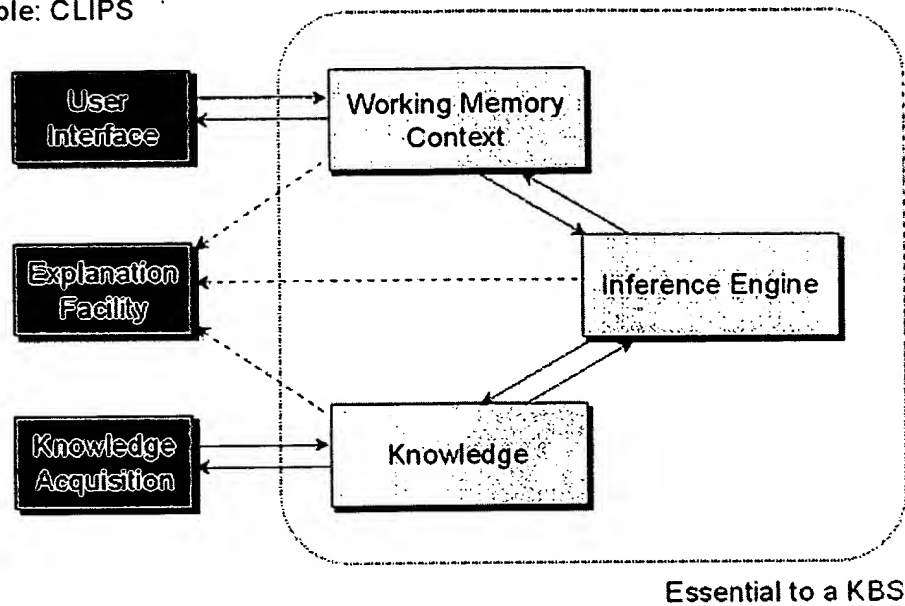


FIG. 1

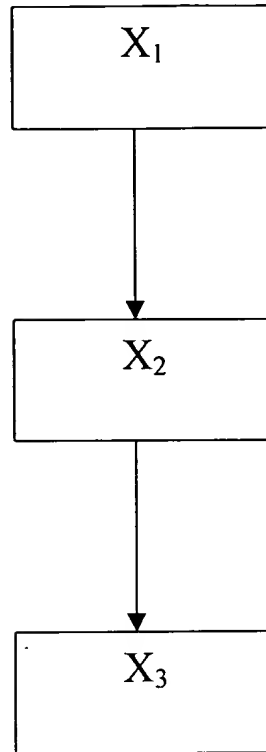


FIG. 2

3-D ELICIT MODEL

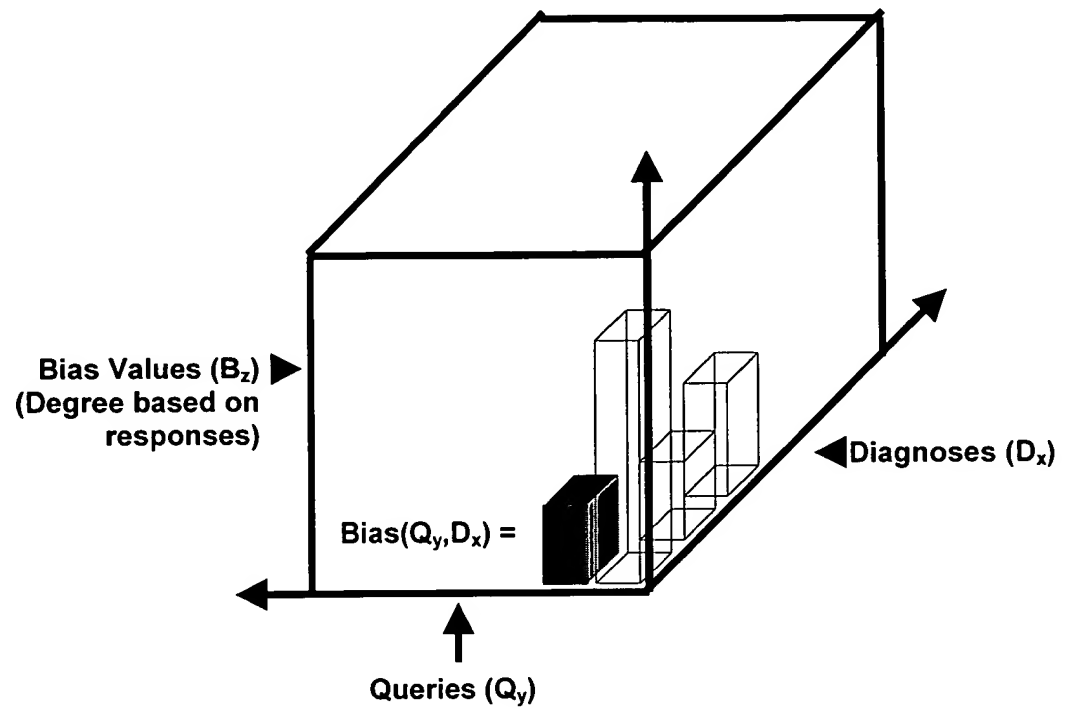
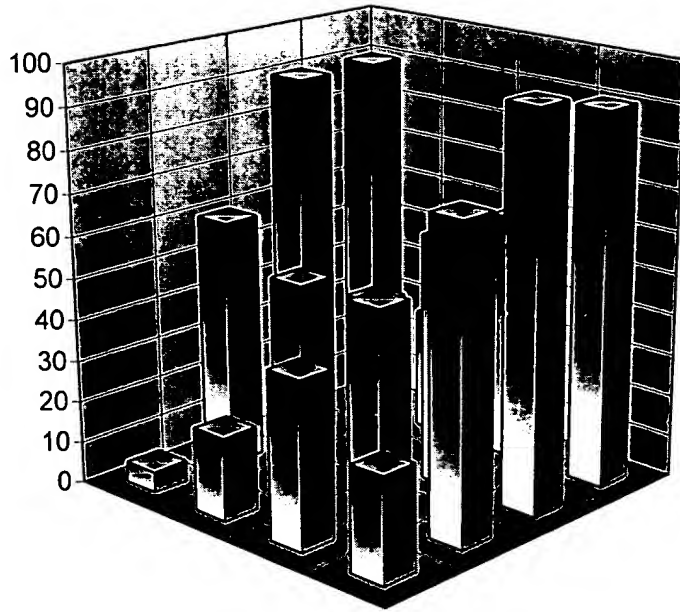


FIG. 3

Sample 3-D Model



Bias = $B(D_1, Q_1) = 90$

| | D ₁ | D ₂ | D ₃ | D ₄ |
|----------------|----------------|----------------|----------------|----------------|
| Q ₁ | 90 | 80 | 45 | 55 |
| Q ₂ | 100 | 20 | 85 | 15 |
| Q ₃ | 25 | 45 | 90 | 95 |
| Q ₄ | 45 | 65 | 20 | 80 |

FIG. 4

End Implementation

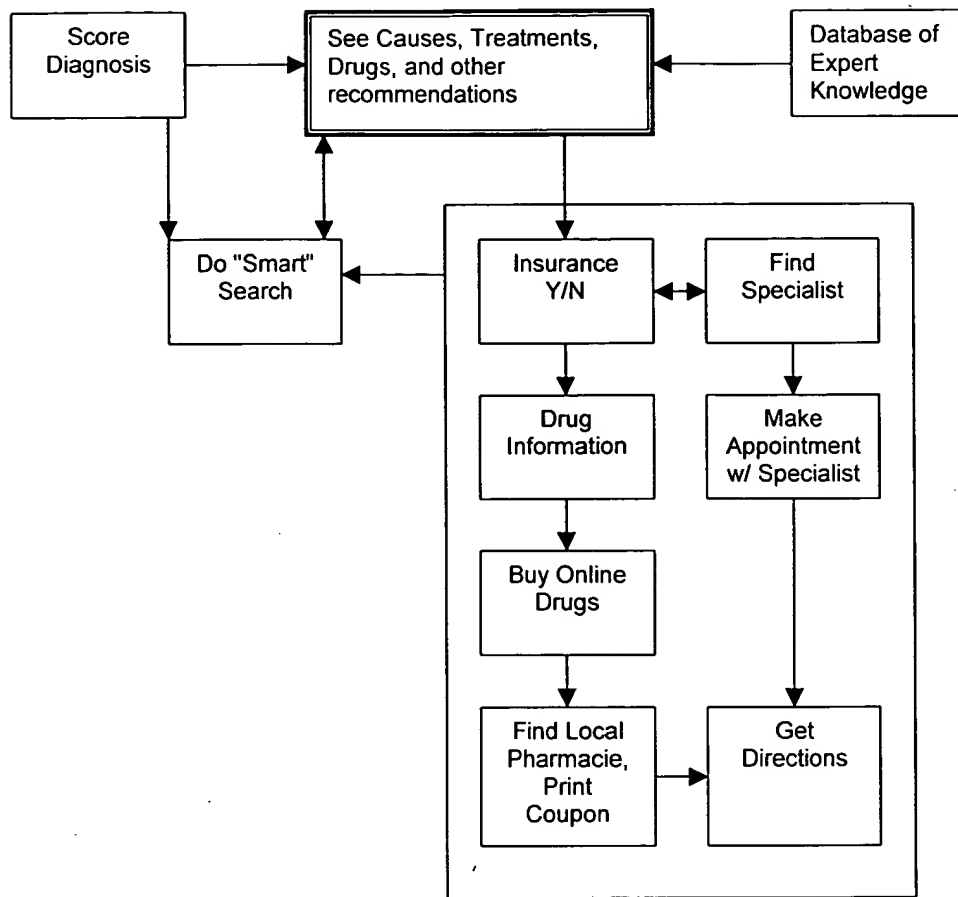


FIG. 5

Process - Acquisition of Expert Data

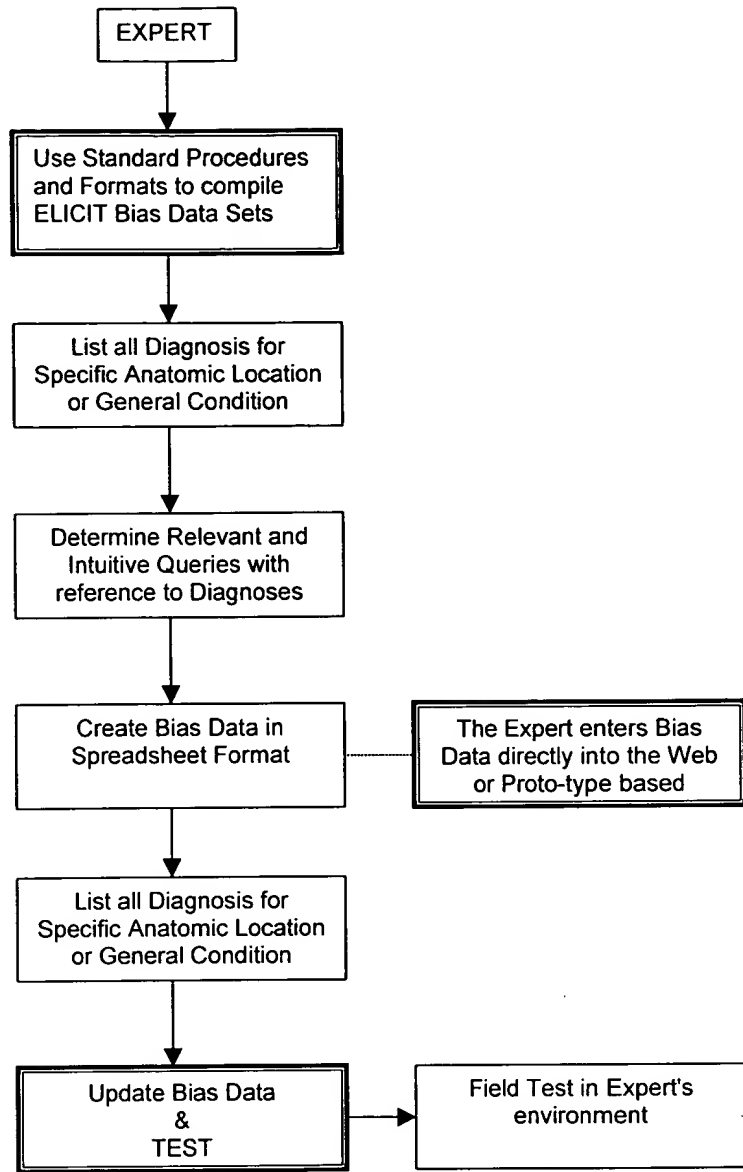


FIG. 6

SAMPLE EXPERT 3D-DATA INPUT SCREEN

MENU

Add Query

Add Diagnosis

▼ Queries ▼

Diagnoses ►

ACL Tear

PCL Tear

MM Tear

L

| | | | | | | | |
|--------|-------------------------------------------------|----|--------------------------|----|--------------------------|----|--------------------------|
| [Edit] | Was there an injury? | 90 | <input type="checkbox"/> | 90 | <input type="checkbox"/> | 90 | <input type="checkbox"/> |
| [Edit] | Did you trip or fall? | 20 | <input type="checkbox"/> | 30 | <input type="checkbox"/> | 30 | <input type="checkbox"/> |
| [Edit] | Were you in an accident involving a vehicle? | 30 | <input type="checkbox"/> | 30 | <input type="checkbox"/> | 20 | <input type="checkbox"/> |
| [Edit] | Were you playing a sport? | 70 | <input type="checkbox"/> | 70 | <input type="checkbox"/> | 70 | <input type="checkbox"/> |
| [Edit] | Did you twist your knee? | 70 | <input type="checkbox"/> | 70 | <input type="checkbox"/> | 70 | <input type="checkbox"/> |
| [Edit] | Did you injure your knee while jumping? | 60 | <input type="checkbox"/> | 60 | <input type="checkbox"/> | 60 | <input type="checkbox"/> |
| [Edit] | Was the injury pain immediate? | 80 | <input type="checkbox"/> | 70 | <input type="checkbox"/> | 60 | <input type="checkbox"/> |
| [Edit] | Was the injury pain delayed? | 20 | <input type="checkbox"/> | 30 | <input type="checkbox"/> | 30 | <input type="checkbox"/> |
| [Edit] | Was the injury swelling immediate? | 80 | <input type="checkbox"/> | 70 | <input type="checkbox"/> | 60 | <input type="checkbox"/> |
| [Edit] | Was the injury swelling delayed? | 20 | <input type="checkbox"/> | 30 | <input type="checkbox"/> | 30 | <input type="checkbox"/> |
| [Edit] | Was there swelling above or around the kneecap? | 95 | <input type="checkbox"/> | 85 | <input type="checkbox"/> | 80 | <input type="checkbox"/> |
| [Edit] | Walking in general or level ground | 10 | <input type="checkbox"/> | 10 | <input type="checkbox"/> | 40 | <input type="checkbox"/> |
| [Edit] | Walking up or down hills | 20 | <input type="checkbox"/> | 20 | <input type="checkbox"/> | 40 | <input type="checkbox"/> |
| [Edit] | Running | 30 | <input type="checkbox"/> | 20 | <input type="checkbox"/> | 40 | <input type="checkbox"/> |
| [Edit] | Biking | 20 | <input type="checkbox"/> | 10 | <input type="checkbox"/> | 30 | <input type="checkbox"/> |
| [Edit] | Squatting | 30 | <input type="checkbox"/> | 20 | <input type="checkbox"/> | 80 | <input type="checkbox"/> |
| [Edit] | While sitting | 20 | <input type="checkbox"/> | 10 | <input type="checkbox"/> | 40 | <input type="checkbox"/> |

FIG. 7

Set Response Ranki

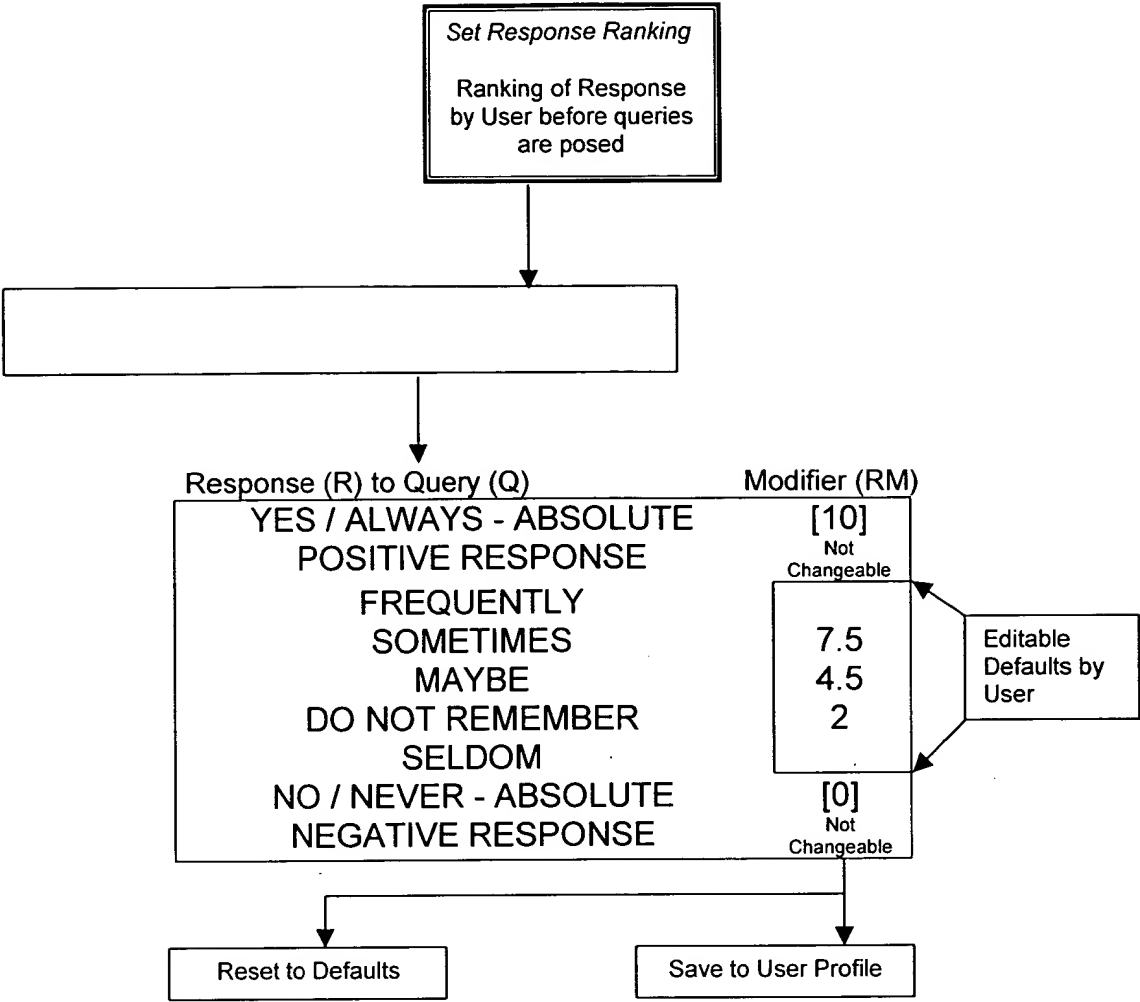


FIG. 8

COMPUTER

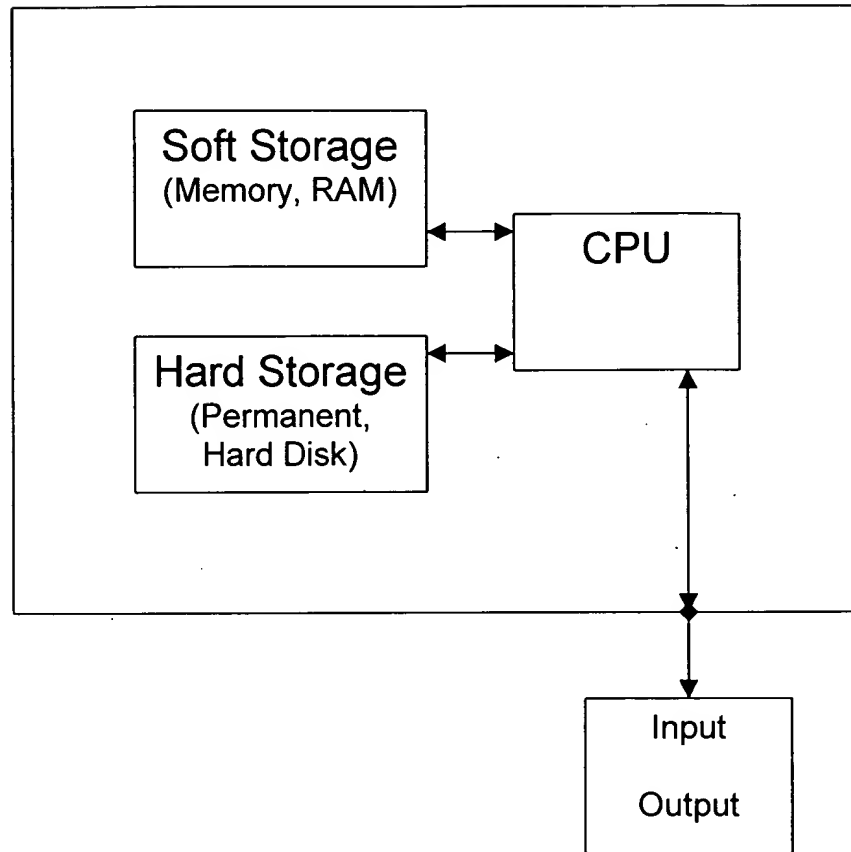
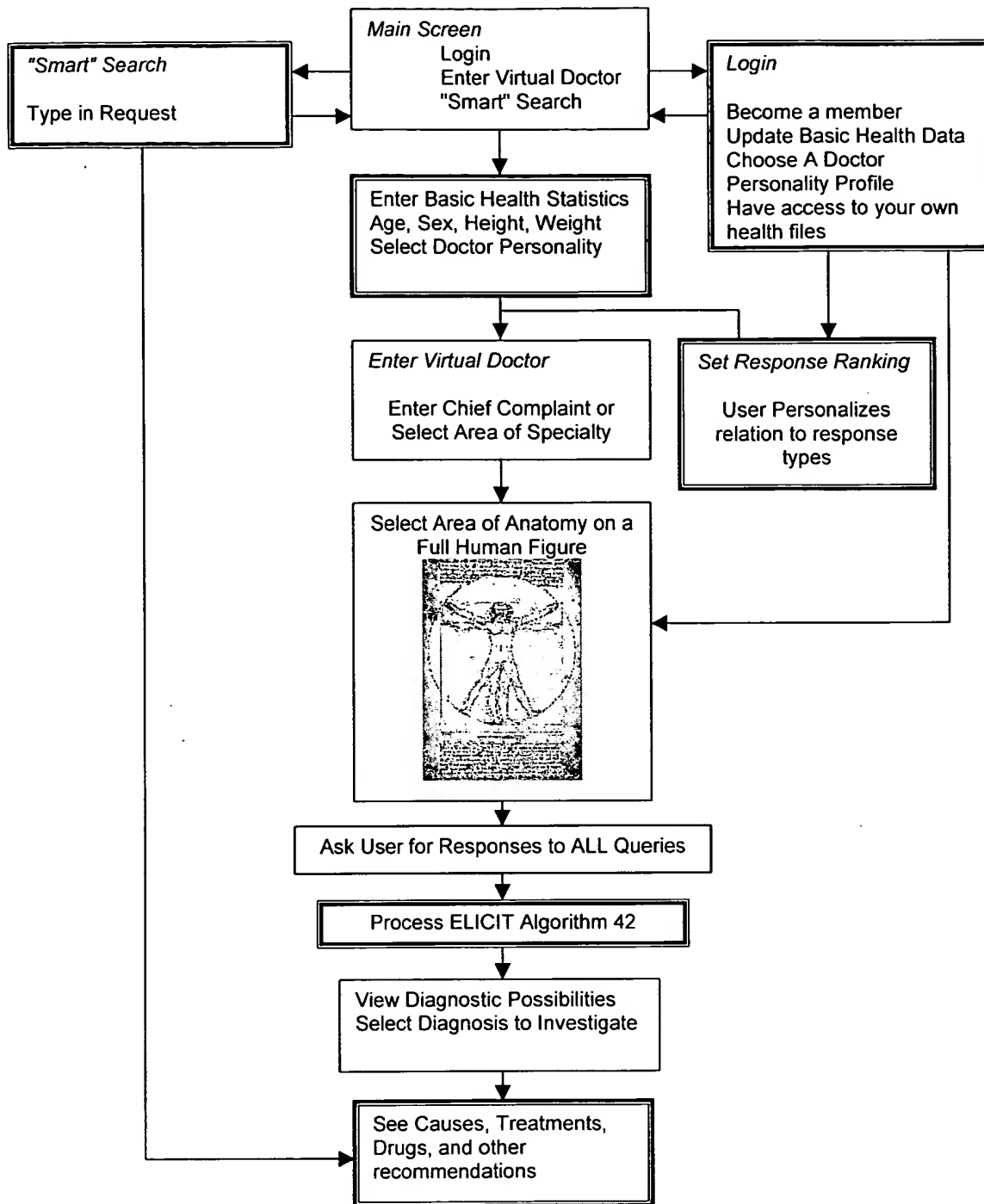


FIG. 9

General Description



Login / Enter Basic Health Stats

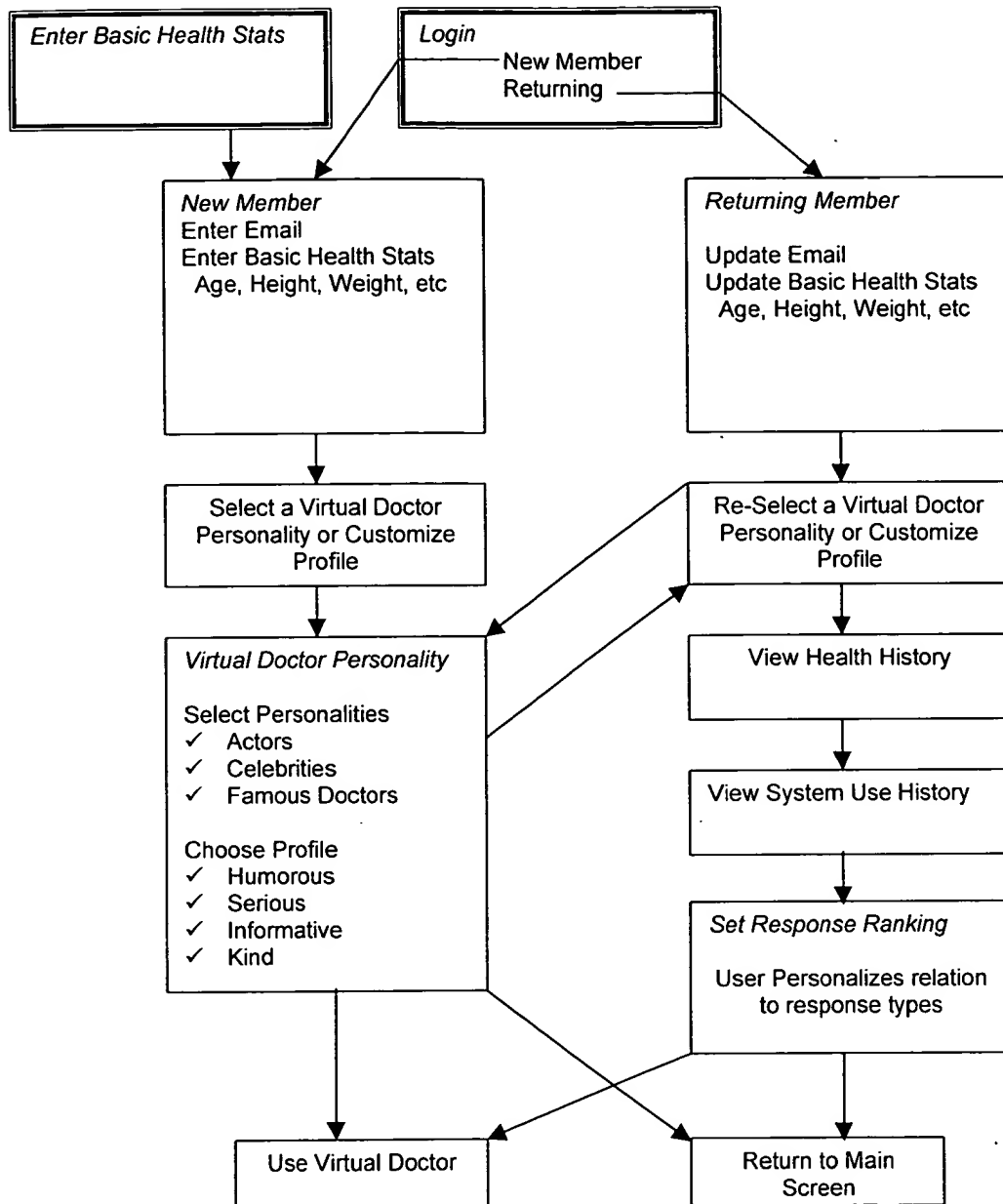


FIG. 11

"Smart" Search

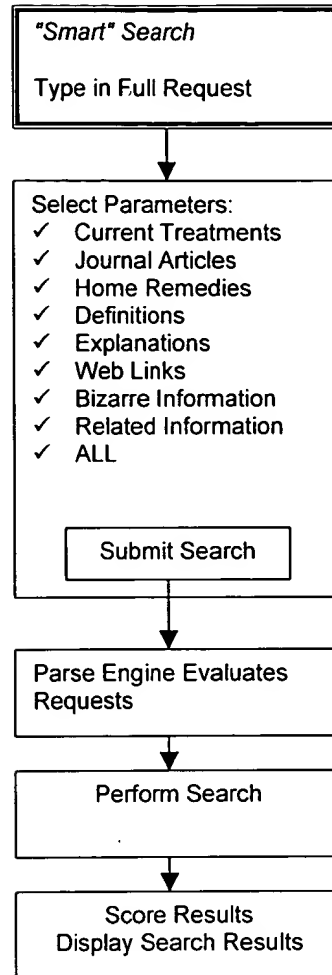


FIG. 12

ELICIT Algorithm 42 (Processing Responses to Queries)

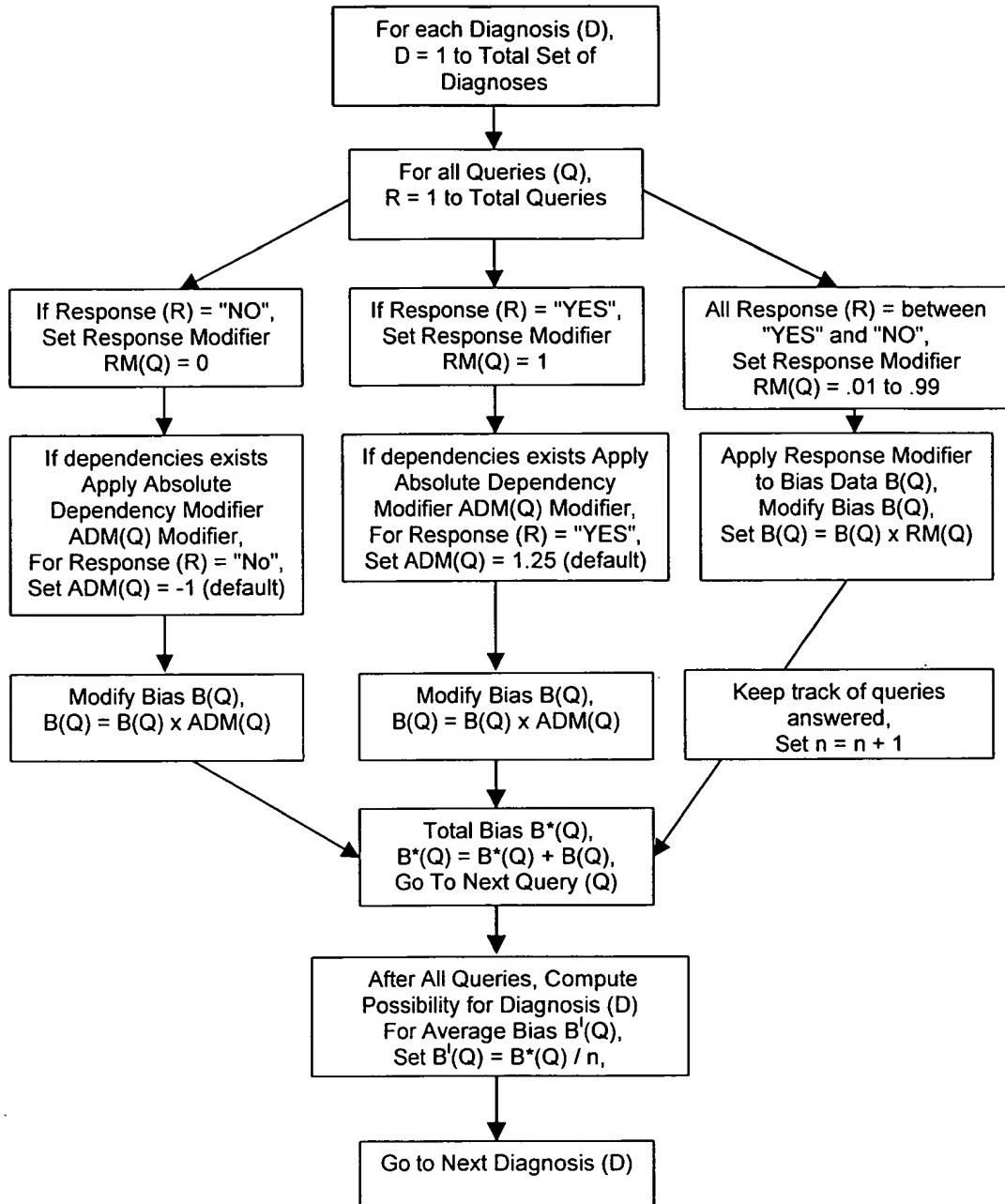


FIG. 13

Please circle/select all the areas where you feel tenderness or pain/discomfort pain?

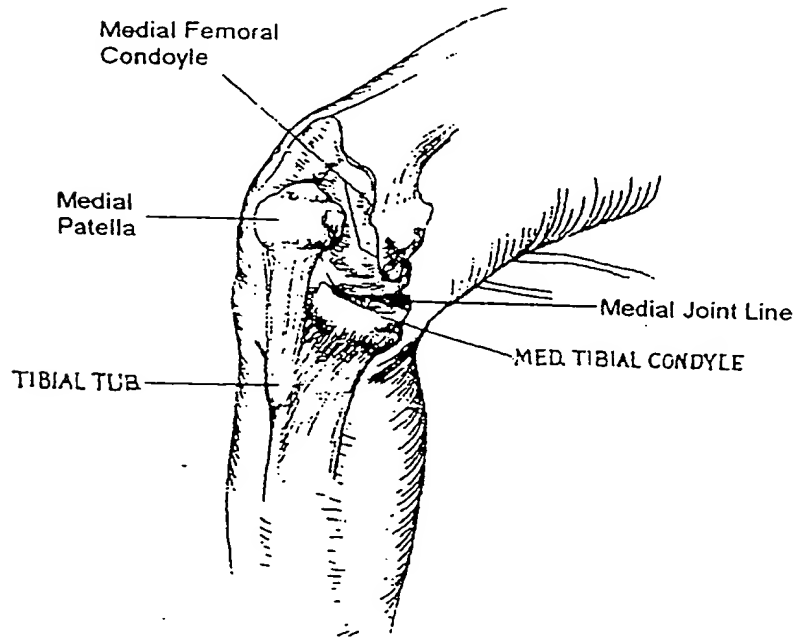
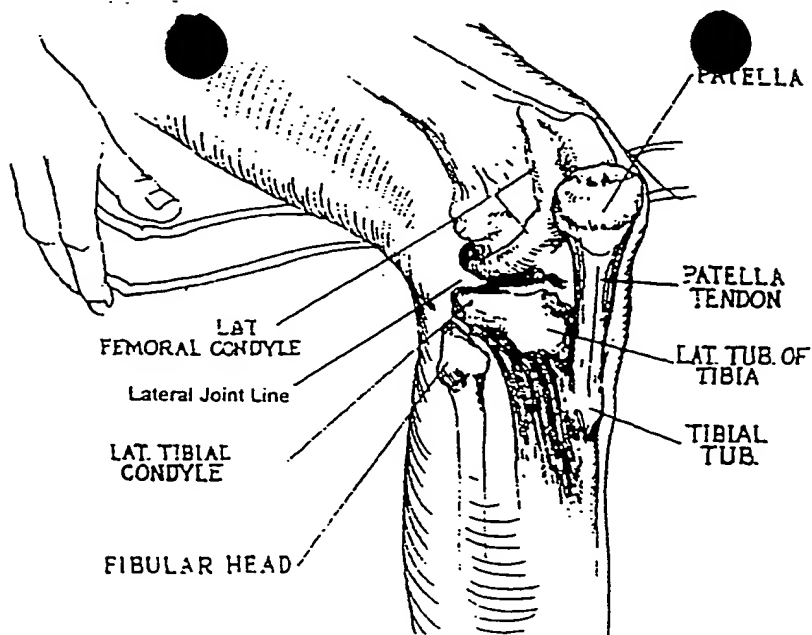


FIG. 14

09757615 040001
T02070 ST025260

Don't wait for Doctors online anymore!

Your Personal Online Doctor...Now!

Want to know what could be wrong with you instantly and get specific information on insurance, treatments, specialists, perscriptions, home remedies and more ?

Just use our free "Virtual Doctor" application with utilizes advanced logic technology to accurately determine your paticular aligment. Ofcourse, you should never use this service to replace professional medical advice from your physican. Infact, we recommend always to seek professional medical advice regardless of the diagnostic response you recieve.

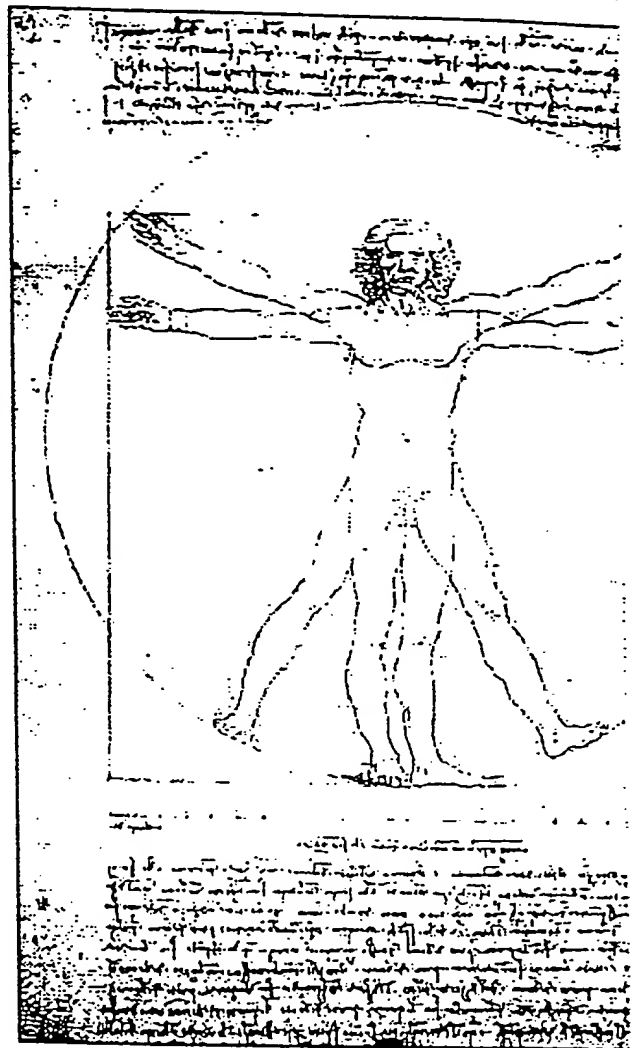


FIG. 15

Non-Injury Activities. Please select any activity that causes pain or discomfort.

- | | |
|-----------------------------------------------|-------------------------------------------------------------|
| <input type="button" value="No"/> | Walking in general or level ground (help) |
| <input type="button" value="No"/> | Walking up or down hills (help) |
| <input type="button" value="No"/> | Running (help) |
| <input type="button" value="Yes"/> | Biking (help) |
| <input type="button" value="Sometimes"/> | Squatting (help) |
| <input type="button" value="Maybe"/> | While sitting (help) |
| <input type="button" value="No"/> | Extended sitting (help) |
| <input type="button" value="Don't remember"/> | In notion standing UP (help) |
| <input type="button" value="No"/> | In motion sitting DOWN (help) |

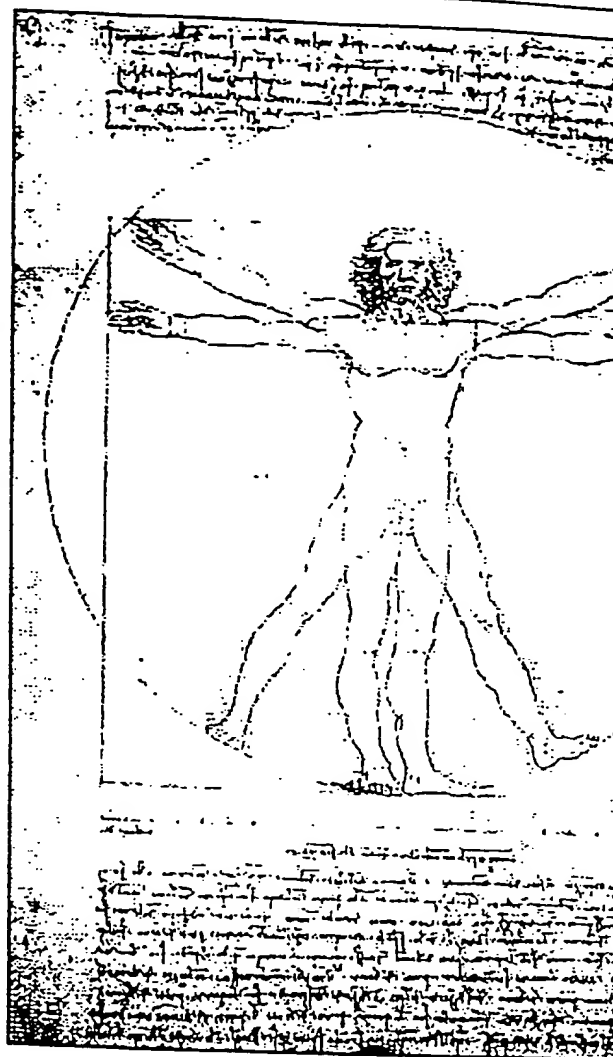


FIG. 16

ELICIT Scalar Range, Rules, Possibility Scoring

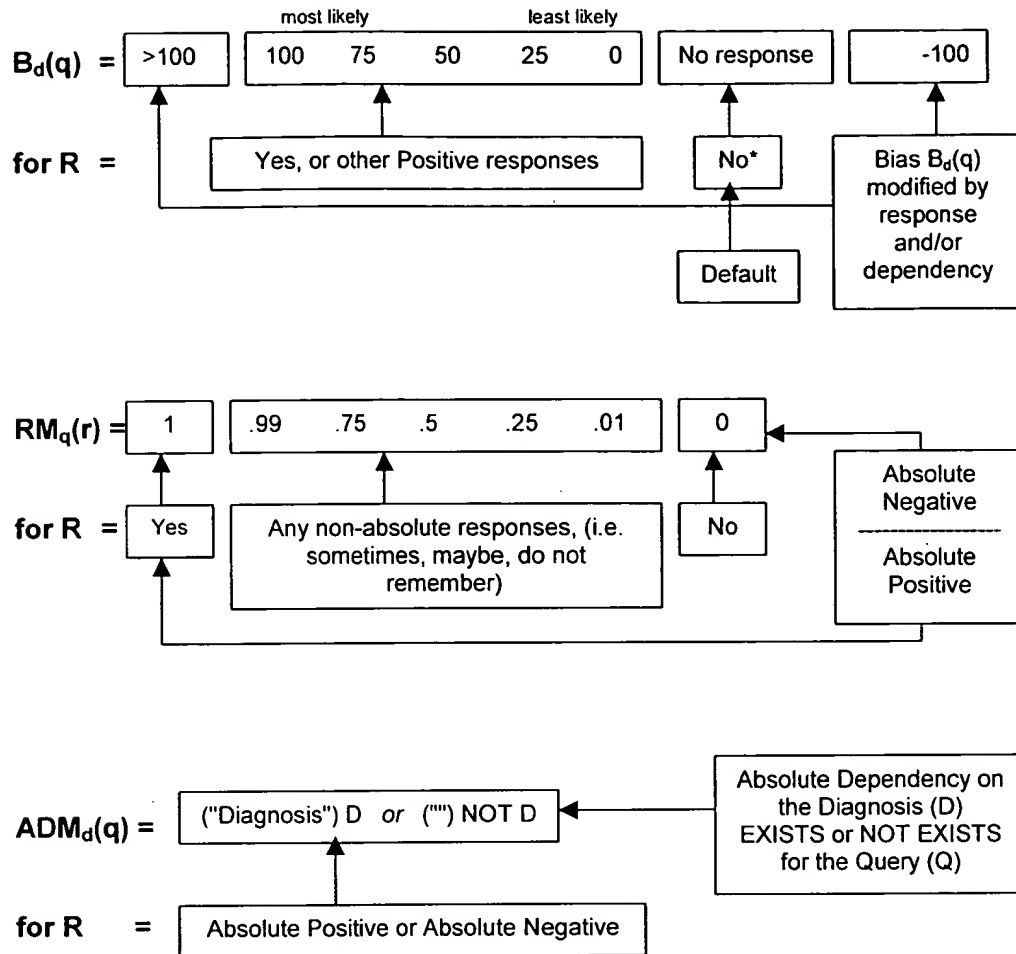


FIG. 17

Enter Questionnaire

Edit Data

Edit Data by
Questions

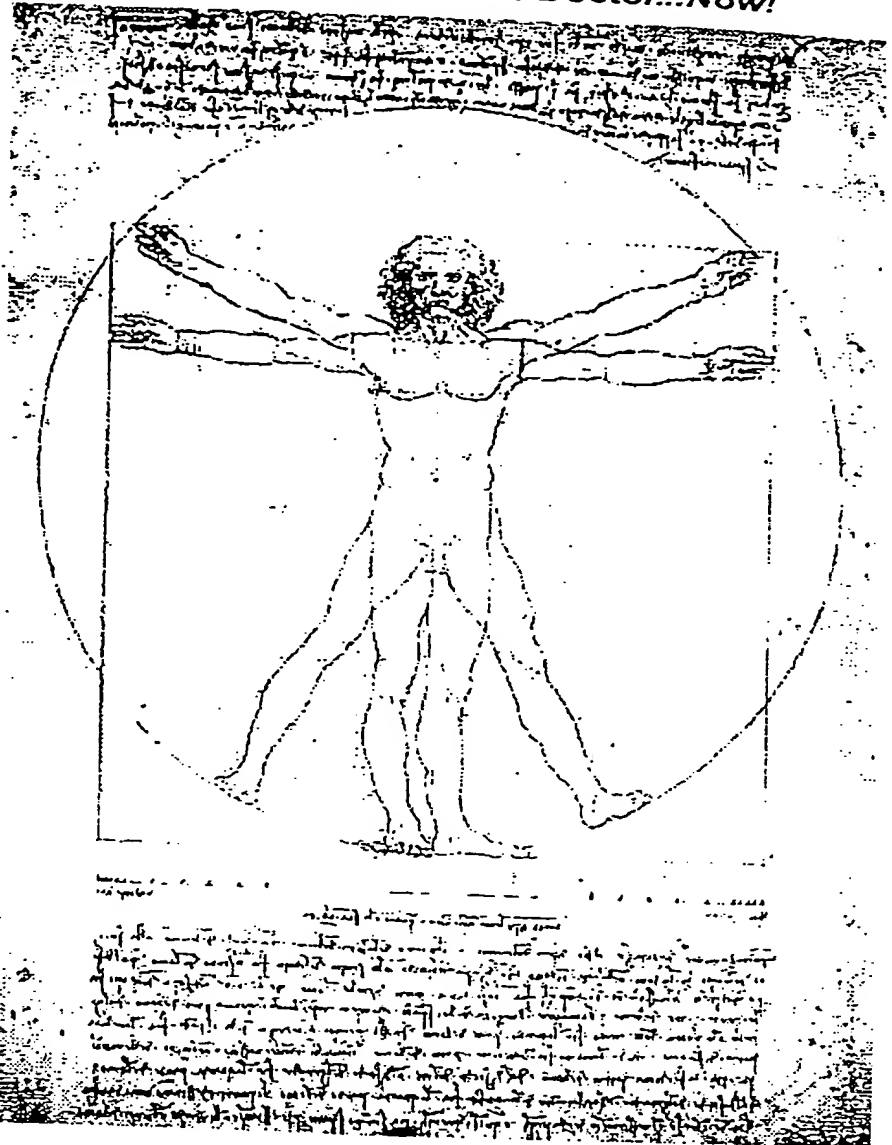


FIG. 18

Answer
Question
s that
apply

Knee

MAIN

Clear All

| | |
|-----------|----------------------------------------------------|
| | Was it a recent injury? |
| | Did you trip or fall? |
| | Were you in an accident involving a vehicle? |
| Yes | Were you playing a sport? |
| | Did you twist your knee? |
| | Did you injury your knee while jumping? |
| | Was the injury pain immediate? |
| | Was the injury pain delayed? |
| | Was the injury swelling immediate? |
| | Was the injury swelling delayed? |
| Yes | Is there swelling above or around the kneecap? |
| Sometimes | Walking in general or level ground |
| Sometimes | Walking up or down hills |
| Yes | Running |
| Sometimes | Biking |
| Sometimes | Squatting |
| | While sitting |
| | Extended sitting |
| | In motion standing UP |
| | In motion sitting DOWN |
| | Has your knee ever locked up? |
| | Do you feel a general stiffness? |
| | You CAN NOT straighten your leg? |
| | Does your knee give out? |
| | Does your knee give out while walking straight? |
| | Does your knee give out while changing directions? |
| | Do you feel a loose body floating around? |
| Yes | Is the skin color around your knee normal? |
| | Is the skin color around your knee black or blue? |
| | Is there redness aound the knee area? |
| | Is there progressive angulation ? |
| Yes | Is there arindina or aratina? |

FIG. 19

| Ability | Area Diagnosis |
|---------|-----------------------------|
| 38 | Ankle Sprain III |
| 75 | Ankle Sprain I, II |
| 25 | Achilles rupture |
| 13 | Osteochondritis Dissecans |
| 13 | Morton's Neuroma |
| 18 | Stress Fx of 2nd metatarsal |
| 25 | Plantar Fasciitis |
| 8 | Pez Planus |
| 3 | Accessory Navicular |
| 3 | Bunion |
| | Posterior tibialis syndrome |
| 3 | Hammer toe |
| 3 | Degenerative Arthritis |
| | Gout |
| | Infection |

FIG. 20

20/29

Edit Fuzzy Data

SCANNED, # 6

MAIN

Previous

Next

New Diagnosis

PHYSICAL AREA Knee

AREA DIAGNOSIS Patella Malalignment

FIG. 21

Fuzzy Response

Diagnostically Dependent

Fuzzy Questions Fuzzy Data

| | | |
|------------------------------------------------|----|-----|
| Was it a recent injury? | 30 | Yes |
| Did you trip or fall? | 20 | Yes |
| Were you in an accident involving a vehicle? | 20 | Yes |
| Were you playing a sport? | 50 | Yes |
| Did you twist your knee? | 40 | Yes |
| Did you injury your knee while jumping? | 70 | Yes |
| Was the injury pain immediate? | 60 | Yes |
| Was the injury pain delayed? | 40 | Yes |
| Was the injury swelling immediate? | 20 | Yes |
| Was the injury swelling delayed? | 70 | Yes |
| Is there swelling above or around the kneecap? | 40 | Yes |
| Walking in general or level ground | 40 | Yes |
| Walking up or down hills | 70 | Yes |
| Running | 80 | Yes |
| Biking | 70 | Yes |
| Squatting | 70 | Yes |
| While sitting | 70 | Yes |
| Extended sitting | 90 | Yes |
| In motion standing UP | 60 | Yes |

21/29

Yes

Yes

Sometim

Sometim

Yes

Sometim

Sometim

Edit Fuzzy Data

SCANNED, # 6

MAIN

◀ Previous

Next ▶

New Diagnosis

| | | |
|--------------------------------------------------------|----|-----|
| In motion sitting DOWN | 40 | Yes |
| Has your knee ever locked up? | 40 | Yes |
| Do you feel a general stiffness? | 50 | Yes |
| You CAN NOT straighten your leg? | 20 | Yes |
| Does your knee give out? | 80 | Yes |
| Does your knee give out while walking straight? | 80 | Yes |
| Does your knee give out while changing directions? | 50 | Yes |
| Do you feel a loose body floating around? | 30 | Yes |
| Is the skin color around your knee normal? | 90 | Yes |
| Is the skin color around your knee black or blue? | 20 | Yes |
| Is there redness around the knee area? | 10 | Yes |
| Is there progressive angulation ? | 10 | Yes |
| Is there grinding or grating? | 80 | Yes |
| Is there any popping or snapping? | 70 | Yes |
| Do you feel weekness in the knee? | 30 | Yes |
| Do you have a fever? | 10 | Yes |
| Do you generally feel weak or tired? | 20 | Yes |
| Is there numbness anywhere? | 10 | Yes |
| At the time of injury, did you feel your knee pop out? | 50 | Yes |
| At the time of injury, did you fell a crack? | 50 | Yes |
| medial femoral condoyle check | 50 | Yes |
| medial joint line check | 20 | Yes |
| medial tibial plateau check | 20 | Yes |
| medial patella check | 90 | Yes |

FIG. 22

22/29

Yes

Yes

Sometim

Sometim

Yes

Maybe

Edit Fuzzy Data

MAIN

Previous

Next

New Diagnosis

| | | |
|-----------------------------------------------------------------------------|----|-----|
| lateral patella check | 70 | Yes |
| tibial tubricle check | 40 | Yes |
| lateral femoral condovle check | 30 | Yes |
| lateral joint line check | 20 | Yes |
| lateral tibial plateau check | 10 | Yes |
| anterior patella check | 40 | Yes |
| posterior knee check | 10 | Yes |
| Is there swelling above or around the kneecap? | 55 | Yes |
| Is there swelling in front of the kneecap? | 20 | Yes |
| Is there constant pain? | 20 | Yes |
| Is there chronic pain? | 25 | Yes |
| Age 16 to 40 | 60 | Yes |
| 40 to 60 | 40 | Yes |
| 60 to 80 | 25 | Yes |
| over 80 | 15 | Yes |
| Do you feel a bump or mass? | 10 | Yes |
| straighten your knee, can you feel a tender band of tissue on the inside of | 40 | Yes |
| Pain wakes at night | 15 | Yes |
| Have you ever felt your knee cap pop out? | 70 | Yes |
| | | Yes |
| | | Yes |
| | | Yes |
| | | Yes |
| | | Yes |

23/29

FIG. 28

| | |
|-------|-------------------|
| 863 | Total Percentages |
| 20 | Total Queries |
| 43.15 | Final Calculation |

24/29

In Re-evaluate



Was there an injury?

Answer:
Maybe

| Ability | Area Diagnosis | |
|---------|-----------------------------|----|
| 3 | Ankle Sprain III | 95 |
| 5 | Ankle Sprain I, II | 90 |
| 5 | Achilles rupture | 70 |
| 3 | Osteochondritis Dissecans | 75 |
| 3 | Morton's Neuroma | 25 |
| 3 | Stress Fx of 2nd metatarsal | 15 |
| 5 | Plantar Fasciitis | 20 |
| | Pez Planus | 5 |
| | Accessory Navicular | 15 |
| | Bunion | 5 |
| | Posterior tibial syndrome | 10 |
| | Hammer toe | 5 |
| | Degenerative Arthritis | 10 |
| | Gout | 5 |
| | Infection | 5 |

FIG. 25

25/29

Injury History:

- ☐ At the time of your injury, did you feel a pop in the knee?
- ☐ At the time of injury, did you feel a crack in the knee?
- ☐ Have you ever felt your knee cap pop out?

If your injury was not recent, please select all the activities that create or induce pain or discomfort:

- ☐ Walking in general, on level ground
- ☐ Walking up or down hills
- ☐ Running
- ☐ Biking
- ☐ Squatting
- ☐ While sitting
- ☐ Extended Sitting
- ☐ In Motion Standing Up
- ☐ In Motion Sitting Down

Please select all the conditions that apply to the physical state of the knee or the local area of your discomfort:

- ☐ Has your knee ever locked up?
- ☐ Do you feel a general stiffness?
- ☐ You CAN NOT straighten your leg?
- ☐ Does your knee give out?
- ☐ Does it give out while walking straight?
- ☐ Does it give out while changing directions?
- ☐ Do you feel a "loose body" floating in or around the knee? ie. a "marble" floating around?
- ☐ Is the skin color normal?
- ☐ Is the skin color black or blue?
- ☐ Is there any redness around the area?
- ☐ Is there any progressive angulation?
- ☐ Is there any grinding or grating?
- ☐ Is there any popping or snapping?
- ☐ Is there any weakness in the knee?

How do you generally feel. Please select any of the general health conditions that apply to you:

- ☐ Do you currently have a fever or had a fever in the past 12 hours?
- ☐ Do you generally feel weak or tired?
- ☐ Is there any numbness anywhere?

A few more questions:

- ☐ When you straighten your leg or knee, can you feel a tender band of soft tissue on the inside part of your knee?
- ☐ Is there swelling above or around the knee?
- ☐ Do you feel a bump or mass around the knee?
- ☐ Is there swelling in front of the kneecap?
- ☐ Is there any chronic or constant pain?

FIG. 26

Query Object in Database

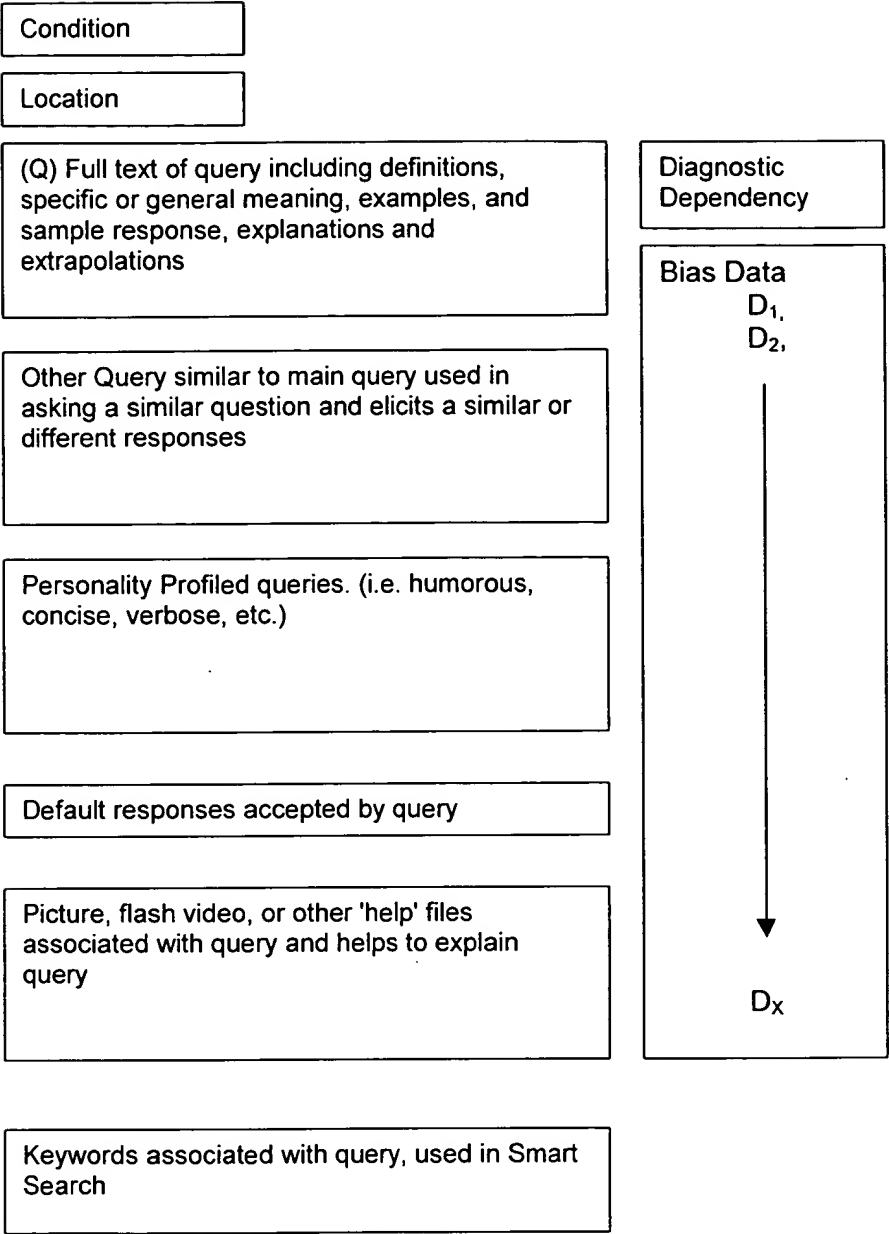


FIG. 27

"Hammer toe", "5", "10", "5", "5", "5", "5", "5", "25", "30", "40", "5", "5", "5", "95", "5", "5", "5", "5", "5", "20", "45", "60",
 "35", "35", "15", "20", "5", "5", "5", "5", "10", "10", "10", "30", "10", "30", "10", "10", "35", "65", "45", "95", "80",
 "Ankle Sprain
 III", "95", "60", "40", "90", "95", "20", "10", "90", "95", "95", "95", "95", "95", "20", "95", "40", "5", "10", "5", "10", "5", "5",
 "5", "5", "15", "5", "20", "5", "5", "95", "95", "25", "5", "5", "5", "5", "5", "15", "35", "60", "50", "30", "15", "5", "5",
 "Ankle Sprain I,
 II", "90", "60", "40", "90", "90", "85", "20", "10", "80", "85", "90", "90", "95", "65", "75", "90", "30", "5", "10", "5", "10", "5", "5",
 "5", "5", "15", "5", "20", "5", "5", "25", "95", "20", "5", "10", "5", "5", "55", "15", "25", "60", "50", "30", "15", "5", "5",
 "Achilles
 rupture", "90", "60", "40", "15", "80", "80", "10", "90", "45", "60", "65", "25", "20", "20", "70", "20", "10", "95", "50", "10", "10",
 "5", "5", "5", "5", "15", "5", "20", "5", "5", "20", "20", "10", "5", "25", "5", "5", "5", "5", "10", "20", "70", "30", "10", "5", "5",
 "Osteochondritis
 Dissecans", "75", "50", "50", "60", "70", "60", "25", "10", "50", "60", "70", "65", "65", "65", "75", "95", "70", "5", "5", "5", "10",
 "5", "5", "5", "5", "15", "5", "20", "5", "5", "40", "65", "15", "5", "10", "5", "5", "5", "10", "25", "70", "30", "20", "15", "5", "5",
 "Morton's
 Neuroma", "25", "40", "20", "5", "10", "5", "10", "5", "40", "65", "70", "5", "5", "5", "95", "5", "5", "5", "5", "5", "5", "5", "5", "5",
 "15", "15", "90", "5", "5", "5", "5", "35", "20", "95", "10", "25", "10", "25", "60", "45", "25", "5", "5",
 "Bunion", "5", "20", "5", "5", "5", "5", "5", "25", "30", "40", "5", "5", "5", "95", "5", "5", "5", "5", "5", "85", "95", "95", "40",
 "40", "40", "20", "55", "5", "5", "5", "15", "10", "10", "90", "10", "30", "15", "10", "25", "50", "65", "50", "20", "35",
 "Stress Fr of 2nd
 metatarsal", "15", "40", "10", "10", "35", "20", "90", "5", "80", "85", "90", "5", "5", "5", "60", "5", "5", "5", "5", "5", "10", "10",
 "5", "10", "20", "5", "20", "5", "5", "5", "5", "5", "5", "15", "15", "95", "20", "5", "20", "50", "30", "15", "10", "5",
 "Degenerative
 Arthritis", "10", "5", "5", "5", "5", "5", "5", "60", "70", "80", "55", "55", "45", "85", "85", "25", "5", "5", "5", "5", "65", "45", "35",
 "5", "45", "45", "25", "5", "5", "30", "30", "15", "20", "20", "70", "5", "20", "40", "30", "10", "50", "65", "85", "30", "25",
 "Plantar
 Fasciitis", "20", "30", "10", "5", "5", "5", "15", "5", "50", "55", "60", "5", "5", "5", "95", "5", "5", "5", "95", "80", "95", "5", "10", "5",
 "5", "15", "5", "20", "5", "5", "5", "5", "25", "85", "90", "5", "15", "10", "25", "10", "15", "70", "35", "20", "5", "5",
 "Accessory
 Navicular", "15", "20", "20", "10", "10", "5", "10", "5", "40", "50", "60", "15", "5", "15", "95", "15", "5", "5", "10", "5", "35", "5",
 "5", "5", "5", "15", "10", "20", "5", "5", "50", "30", "95", "20", "25", "10", "10", "10", "40", "95", "40", "30", "30", "10", "5", "5",
 "Pez
 Planus", "5", "30", "5", "5", "5", "5", "5", "5", "30", "40", "50", "5", "5", "5", "95", "5", "5", "5", "5", "15", "15", "25", "25", "30", "5",
 "95", "75", "20", "5", "10", "5", "15", "20", "15", "15", "20", "10", "10", "85", "20", "15", "25", "35", "25", "5", "5",
 "Gout", "5", "5", "5", "5", "20", "20", "5", "5", "20", "30", "35", "5", "5", "5", "95", "5", "5", "5", "5", "5", "95", "95", "35", "95",
 "15", "10", "20", "10", "5", "5", "5", "5", "5", "95", "10", "30", "10", "5", "15", "60", "40", "20", "20", "15",
 "Posterior tibialis
 syndrome", "10", "10", "10", "5", "5", "5", "10", "5", "40", "45", "60", "15", "5", "10", "95", "15", "5", "5", "10", "5", "35", "5", "5",
 "5", "5", "90", "95", "20", "5", "5", "70", "25", "75", "20", "25", "10", "10", "10", "60", "80", "10", "35", "65", "30", "5", "5",
 "infection", "5", "5", "5", "5", "5", "5", "5", "50", "60", "70", "90", "80", "80", "50", "70", "15", "5", "5", "5", "5", "5", "5", "7",
 "5", "15", "5", "5", "90", "75", "10", "15", "15", "15", "15", "45", "15", "25", "30", "30", "20", "30", "40", "30", "5", "5",

FIG. 28

H Injury Activities. Please indicate whether you have had an injury recently or in the recent past that may help assess your condition.

1 1 0 none Was there an injury?

2 1 0 none Were you playing a sport?

3 1 0 none Did you trip and fall?

4 1 0 none Did you turn your foot inward?

5 1 0 none Did you have immediate pain?

6 1 0 none Did your ankle/foot swell immediately?

H Injury History. Because of an old injury do any of the following questions apply?

7 2 0 none Did you increase your workout/activity lately?

8 2 0 none Did you feel a pop in the back of your leg?

H Non-Injury Activities. Please select any activity that causes pain or discomfort.

9 3 0 none Walking

10 3 0 none Running

11 3 0 none Jumping

H Select/Answer any question(s) that apply to your current physical state of the ankle or foot.

12 4 0 none Is your ankle swollen?

13 4 0 none Is your ankle swollen on the outside (lateral)?

14 4 0 none Is your ankle swollen on both sides?

15 4 0 none Can you bear weight?

16 4 0 none Does your ankle swell intermittently?

17 4 0 none Does your ankle lock up?

18 4 0 none Can you feel a defect in your Achilles tendon?

19 4 0 none Do you have pain in your heel?

20 4 0 none Do you have pain on the bottom of your heel?

21 4 0 none Do you have pain on the side of your heel?

22 4 0 none Do you have pain in your big toe?

23 4 0 none Is there a bump?

24 4 0 none Is your big toe angled to the side? (see photo)

25 4 0 none Is your big toe red hot and swollen?

26 4 0 none Is your foot flat?

27 4 0 none Is your foot getting flatter?

28 4 0 none Is your 2nd toe longer than your big toe?

H Select/Answer any question(s) that apply to your general physical state.

29 5 0 none Do you have a fever?

30 5 0 none Are you a diabetic?

H Please select any area(s) that you feel tenderness.

31 6 0 none medial malleolus check

32 6 0 none lateral malleolus check

33 6 0 none accessory navicular check

34 6 0 none plantar heel check

35 6 0 none medial heel check

36 6 0 none great toe MTP joint check

37 6 0 none 3rd webspace check

38 6 0 none 2nd metatarsal check

39 6 0 none sole of foot at arch check

40 6 0 none medial navicular check

H Please Select your Age

41 7 0 none 18-40

42 7 0 none 40-60

43 7 0 none 60-80

44 7 0 none Over 80

H A few more question(s).

45 8 0 none Does your toe bend downward?

46 8 0 none Does your toe ride over the next toe?

FIG. 29